

## Abstract

A method and apparatus for enhancing the receiving and information identification functions of multiple access communications systems by employing one or more optical processors configured as a bank of 1-D correlators. The present invention is particularly useful in a DS/SS CDMA communications system, resulting in a multiuser CDMA system that approaches carrier to noise performance ( $C/N$ ) as opposed to being limited by multiple access interference (MAI). The correlators are arranged in parallel to detect and/or demodulate the received signal, in conjunction with one or more complex algorithms to perform near-optimum multiuser detection, perform multipath combining and/or perform carrier Doppler compensation. An improved receiver in accordance with the present invention comprises means for receiving a plurality of signals transmitted through a communications channel; signal conversion means for converting the received signals into a form suitable for input to the multichannel correlator; a multichannel optical correlator for identifying the presence of particular waveforms and estimating the relative time delay or delays, carrier frequency offset from expected, RF amplitude and RF phase for each received spread spectrum waveform present in the received plurality of signals; a controller for determining and providing to the optical correlator the appropriate set of reference hypotheses; and one or more receiver algorithms depending on the exact receiver function to be performed.